



Course Syllabus: Nanomaterials - MSE 318

Division	Physical Science and Engineering Division
Course Number	MSE 318
Course Title	Nanomaterials
Academic Semester	Spring
Academic Year	2017/2018
Semester Start Date	01/28/2018
Semester End Date	05/24/2018
Class Schedule (Days & Time)	01:00 PM - 02:30 PM Mon Wed

Instructor(s)				
Name	Email	Phone	Office Location	Office Hours
Osman Mohammed Bakr	osman.bakr@kaust.edu.sa	+966128084439	3274, 5, Al-Kindi (bldg. 5)	Monday 4-5pm

Teaching Assistant(s)	
Name	Email

Course Information	
Comprehensive Course Description	This course describes the most recent advances in the synthesis, fabrication and characterization of nanomaterials. Topics to be covered: zero-dimensional materials, including nanoparticles, quantum dots and nanocrystals; one-dimensional materials including nanowires and nanotubes; two-dimensional materials including self-assembled monolayers, patterned surfaces and quantum wells; three-dimensional materials including nanoporosity, nanocomposites, block copolymers and supra-crystals. Emphasis is made on the fundamental surface and size-related physical and chemical properties of nanomaterials and their applications in biosensing, nanomedicine, catalysis, photonics and nanoelectronics.
Course Description from Program Guide	This course describes the most recent advances in the synthesis, fabrication and characterization of nanomaterials. Topics to be covered: Zero-dimensional nanomaterials, including nanoparticles, quantum dots and nanocrystals; one dimensional materials including nanowires and nanotubes; two-dimensional materials: including self-assembled monolayers, patterned surfaces and quantum well; three-dimensional nanomaterials: including nanoporosity, nanocomposites, block copolymers, and supra-crystals. Emphasis on the fundamental surface and size-related physical and chemical properties of nanomaterials; and their applications in biosensing, nanomedicine, catalysis, photonics, and nanoelectronics.
Goals and Objectives	<ul style="list-style-type: none"> -To have an updated knowledge of the state-of-the-art in nanomaterials and their applications -To understand why nanoscaled materials have different properties from their bulk counterparts and how this drives the continuous effort to evolve them.
Required Knowledge	Prerequisite: MSE 302 Electronic Properties of Materials, MSE 303 Thermodynamics & Equilibrium Processes, MSE 304 Applied Quantum Mechanics , MSE 301 Crystallography and Diffraction, and ChemS 102 Inorganic Chemistry (or equivalent)
Reference Texts	<p>1) G. A. Ozin, A. C. Arsenault and L. Cademartiri, <i>Nanochemistry: A Chemical Approach to Nanomaterials</i>, 2nd Edition, RSC Publishing, 2009. ISBN: 978-1-84755-895-4.</p> <p>2) Y. Gogotsi and V. Presser (Editors), <i>Carbon Nanomaterials</i>, 2nd Edition, CRC Press, 2014. ISBN: 978-1-4398-9781-2.</p>

Method of evaluation	15.00% - Research Project 40.00% - Problem sets 15.00% - Presentation 30.00% - Final exam
Nature of the assignments	Written problem sets, case study, final exam, and final paper and presentation.
Course Policies	Late assignments will not be accepted.
Additional Information	

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Mon 01/29/2018	Introduction
1	Wed 01/31/2018	Quantum Mechanics
2	Mon 02/05/2018	Quantum Mechanics
2	Wed 02/07/2018	Quantum Mechanics
3	Mon 02/12/2018	Nanophotonics
3	Wed 02/14/2018	Nanophotonics
4	Mon 02/19/2018	Synthesis/Assembly
4	Wed 02/21/2018	Synthesis/Assembly
5	Mon 02/26/2018	Synthesis/Assembly
5	Wed 02/28/2018	Synthesis/Assembly
6	Mon 03/05/2018	Nanofabrication
6	Wed 03/07/2018	Nanofabrication
7	Mon 03/12/2018	Nanofabrication
7	Wed 03/14/2018	Characterization
8	Mon 03/19/2018	1D materials
8	Wed 03/21/2018	1D materials
9	Mon 03/26/2018	1D materials
9	Wed 03/28/2018	2D materials
10	Mon 04/02/2018	2D materials
10	Wed 04/04/2018	2D materials
11	Mon 04/09/2018	2D materials
11	Wed 04/11/2018	2D materials
12	Mon 04/16/2018	0D materials
12	Wed 04/18/2018	0D materials
13	Mon 04/23/2018	0D materials
13	Wed 04/25/2018	Hybrid organic-inorganic materials
14	Mon 04/30/2018	Hybrid organic-inorganic materials
14	Wed 05/02/2018	Hybrid organic-inorganic materials
15	Mon 05/07/2018	Applications in optoelectronics
15	Wed 05/09/2018	Applications in optoelectronics
16	Mon 05/14/2018	Applications in optoelectronics
16	Wed 05/16/2018	Student Final Project Presentation
17	Mon 05/21/2018	Student Final Project Presentation
17	Wed 05/23/2018	Student Final Project Presentation

Note

The instructor reserves the right to make changes to this syllabus as necessary.